

AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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FOR THE COMMANDER

if . un Cui HENNING E. VON GIERKE Director

Biodynamics and Bionics Division

Aerospace Medical Research Laboratory

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The USAF F-111A is a tactical fighter aircraft powered by two TF30-P-1 turbofan engines. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for three engine/power conditions. Near-field data are reported for 4 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for

total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 11 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. Refer to Volume 1 of this handbook, USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application, AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723104, Measurement and Prediction of Noise Environments of Air Force Operations.

The authors gratefully acknowledge Mr. Robert G. Powell for his assistance in preparing this report, Mr. Keith Kettler, Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton for assistance in the mechanics of data processing, and Mrs. Norma Peachey and Mr. Mike Patterson for assistance in typing and preparation of the graphics.

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INTRODUCTION

The USAF F-111A is a tactical fighter-type aircraft powered by two TF30-P-1 turbofan engines. The aircraft was manufactured by the General Dynamics and the engines by Pratt and Whitney, a Division of United Aircraft.

This volume provides measured and extrapolated data defining bioacoustic environments produced by this aircraft during ground runup operations. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with ground runups of the F-111A aircraft. These measured data were also published (reference 1) in 1968 in another format.

This volume is one of a series published by the AMRL under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type, noise data in the handbook describe the noise produced during ground operations of aircraft, ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15°C temperature, 70% rel humidity, 0.760 meters Hg barometric pressure), to derive comparable data for other meteorological conditions. Refer to Volumes 1 and 2 (references 2 and 3) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of each updated index.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; AUTOVON 78-53675 or 78-53664; Commercial (513) 255-3675 or (513) 255-3664.

Cole, John N., J. F. Rose, Jr., Maj., Acoustic Environments of the F-111A Aircraft During Ground Runup, AMRL-TR-68-14, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio, 1968.

Cole, John N., USAF Bioenvironmental Noise Data Handbook Volume 1: Organization, Content and Application, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.

^{3.} Cole, John N., USAF Bioenvironmental Noise Data Handbook, Volume 2: Procedure to Evaluate Effects of Non-standard Meteorological Conditions on Far-Field Noise, AMRL-TR-75-50 (2), AMRL, WPAFB, OH, 1975.

NEAR-FIELD NOISE

MEASUREMENTS

AMRL acquired near-field noise data on the F-111A aircraft during ground runup operations of its turbofan engines. For these tests the aircraft was located on a concrete runup pad at Wright-Patterson AFB with no significant reflecting surfaces in the vicinity except the ground plane. Table 1 gives the surface meteorological conditions and the engines' power conditions. The ground-crew chief selected power conditions and near-field locations generally used during routine maintenance or engine runup for preflight checks.

At each near-field location a test engineer randomly moved a hand-held microphone in and around each location, probing all areas where a crew member's head would normally be located. He recorded all the noise samples on magnetic tape. During analysis of each sample, he determined the octave band root-mean-square sound pressure to derive a power-averaged level for each location. Figure 1 shows the four near-field locations where ground crews are usually located for maintenance and/or preflight checkout operations. Estimates of noise levels at other locations are difficult in the near-field since the noise source is spatially distributed, i.e., not a point source. The noise levels at near-field locations can vary widely depending upon relative distances from each noise source (intake noise, exhaust noise, panel resonances, internal engine noise through the engine wall, etc.).

Table 1 lists the numeric/alphabetic designators used on the data pages in this report to identify the measurement locations and test conditions. For example, the designator 1/A means ground crew location 1 and test condition A.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the F-111A aircraft at the four ground crew locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures given in Table 3, which are widely used to assess the effects of noise on personnel and their performance.

All near-field data are for the meteorological conditions at the time of test but are valid for all typical airbase meteorology because of the short sound propagation distances involved.

TABLE 1

MEASUREMENT LOCATIONS AND TEST CONDITIONS FOR NEAR-FIELD NOISE MEASUREMENTS

F-111A Aircraft, Ground Runup, Wright-Patterson AFB 29 August 1967 Tail # 63-9775

Ground Crew Location

1	Engine Start
2	Wheel Chock Pull
3	Engine Trimming
4	Marshal

Aircraft Engine Operation

A	Engine #1 at 85% RPM Engine #2 at Idle	
Meteorology		

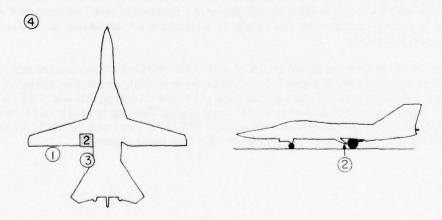


Figure 1. Near-Field Measurement Locations on Runup Pad at Wright-Patterson AFB OH

FAR-FIELD NOISE

MEASUREMENTS

AMRL acquired the near- and far-field data during a 1- 2-hour test period, thus keeping similar meteorological conditions. Figure 2 shows the aircraft, on a concrete runup pad, the ground cover and aircraft orientation relative to 11 microphone measurement sites on a semicircle. The center of the 76 meter radius semicircle used in surveying the TF30-P-1 engines was on the ground directly below the intersection of the aircraft's centerline and the plane passing through the engines' nozzle exits. The ground runup pad did not have a blast deflector; therefore, the engines' exhausts were in a "free-flow" condition.

Table 4 provides cockpit readouts of engines in operation for each far-field test. Also listed in this table are the surface meteorological conditions during data acquisition.

All 11 microphone measurement sites are in the acoustic far-field of the source where the sound wave-fronts spherically diverge and the noise source may be regarded as a point source.

A portable microphone/tape recorder system was used to sequentially record the noise at each far-field location. The microphone was hand-held 1.8 meters (6 feet) above the ground and pointed at the source (0° angle of incidence).

RESULTS

Table 5 lists the overall and octave band SPL measured and estimated* at the far-field locations under meteorological conditions at the time of the test. Data in all other figures and tables are based on these levels. These data were normalized to 100 meters distance and standard meteorological conditions (15°C temperature, 70% relative humidity, 0.760 meter Hg barometric pressure) and used to derive the graphic data in Figure 3 which provides a compact summary of the far-field noise characteristics of the F-111A aircraft in a standard format.

Figure 4 and Table 6 present two basic acoustic measures, the acoustic power levels and the directivity index, respectively. The acoustic power level describes the power radiated by the source as a function of frequency. The directivity index is a standard acoustical engineering measure that describes the geometric way in which the source radiates this power as a function of both frequency and angle from source. These basic source measures are primarily of interest for acoustical engineers and noise generation/control specialists.

*NOTE: The computer software program used to calculate some of the results presented in the handbook requires input data at 10-degree increments between starting and ending angles. As shown in Figure 2, six such measurement angles were not surveyed during this test. To fulfill software requirements estimated data were used at these angles. These estimated levels were derived by interpolating/extrapolating from octave band SPL data measured at the 11 angles and by considering directivity patterns typical for this type noise source.

Estimates of the noise levels for a different number of engines operating (e.g., two engines in A/B) can be determined as explained in Volume 1 of this handbook.

Figures 5 through 11 are sets of equal noise contours describing seven different measures of noise as a function of angle and distance from the source for standard day meteorology. They are, respectively, overall sound pressure level, C-weighted sound level, A-weighted sound level, perceived noise level, speech interference level, permissible exposure times for personnel and octave band sound pressure levels.

No data are presented beyond the 170 degree location because of turbulent air flow behind the aircraft. Typically, the A-weighted levels for the 180 angle are 5 to 15 dBA below the level at the 170 degree location.

Test personnel performed noise surveys during quiet periods when the background noise was minimal, e.g., early in the morning when no other aircraft or engine test stands were operating. Data eliminated because they were near the background/electronic noise were generally not significant because the levels were so low.

Volume 2 of the handbook describes the influence of meteorology on far-field noise environments, and provides, if required, the factors necessary to adjust the handbook's standard meteorological day data.

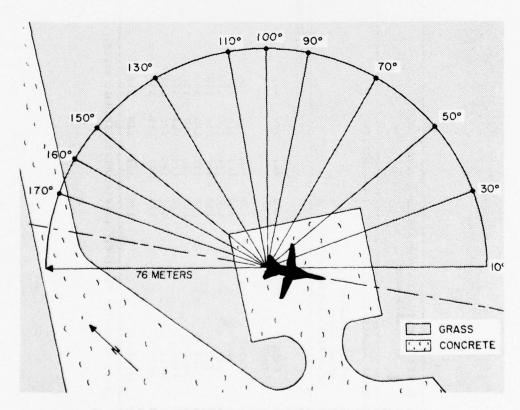


Figure 2. Far-Field Measurement Locations on Runup Pad at Wright-Patterson AFB OH

TABLE: MEASURED SOUND PRESSURE LEVEL (08) 2 OCTAVE BAND	RESSURE	ירפעפר	(08)) DUENTIFICATION:) UMEGA 3.2 TEST 77-002-001
NUISE SOURCE/SUBJECT:	J.	OFERATIONS	3 14 6	2	10 NDN 0
F-1114 AIRCRAFT					1 12 MAK 76
GROUND CREW NEAR FIELD NOISE LEVELS) PAGE F1
				COATION/COMDITION	
FREG	1/4	2/A	3/4	4/4	
31.5	16	66	£ 5	7.5	
63	110	111	110	101	
125	116	115	116	109	
250	122	117	110	112	
200	117	117	110	109	
1000	115	110	115	107	
2000	113	119	113	107	
0004	112	120	121	108	
8000	114	121	118	112	
DVERALL	125	127	126	110	

NUISE SOURCE/SUBJECT: (OPERATION:) NUISE SOURCE/SUBJECT: (OPERATION:) NUISE SOURCE/SUBJECT: (OPERATION:) NUISE CROWN CREW CORNING CREW CORNIN	TEST 73-002-001 KUN 01 12 MAR 76
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E LEVELS (1/A 2/A 3/A 4/A 1/A 2/A 3/A 4/A 1/A 2/A 3/A 4/A ERALL SOUND LEVEL (DASLC IN DBC) AT EAR ERALL SOUND LEVEL (UASLA IN DBA) AT EAR SSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 125 126 125 116 127 126 125 116 MUFFS 101 101 101 94 25 25 25 85 L 1700 EAR MUFFS 37 97 96 89	
1/A 2/A 3/A 4/A ERALL SOUND LEVEL (DASLC IN DBC) AT EAR ESTALL SOUND LEVEL (UASLA IN DBA) AT EAR SSIBLE TIME (T IN MINUTES) FUR UNE EXPOSURE PER DAY (AFR 161-35, JULY 125 126 125 116 127 126 125 116 128 126 125 116 129 120 101 101 94 1700 EAR MUFFS 17 77 96 89	PAGE H1
1/A 2/A 3/A 4/A ERALL SOUND LEVEL (OASLC IN DBC) AT EAR ERALL SOUND LEVEL (OASLC IN DBA) AT EAR SSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 125 126 125 116 P P P P MUFFS 101 101 101 94 L 1700 EAR MUFFS 25 85 27 96 89	
ERALL SOUND LEVEL (OASLC IN DBC) AT EAR ERALL SOUND LEVEL (UASLA ÎN DBA) AT EAR SSIBLE TIME (T IN MINUTES) FUR UNE EXPOSURE PER DAY (AFR 161-35, JULY 125 126 125 116 P P P P MUFFS 101 101 101 94 L 1700 EAR MUFFS 25 85 A7 97 96 89	
ERALL SOUND LEVEL (OASLC IN DBC) AT EAR ERALL SOUND LEVEL (OASLA IN DBA) AT EAR SSIBLE TIME (T IN MINUTES) FUR UNE EXPOSURE PER DAY (AFR 161-35, JULY 125 126 125 116 P P P P P NUFFS 101 101 94 25 25 85 61 1700 EAR MUFFS 95 96 89	
125 126 126 1 122 126 125 1 P P P P P P P P P P P P P P P P P P P	niks)
125 126 126 1 122 126 125 1 P P P P P P P P P P P P P P P P P P P	
MUFFS 101 101 101 101 25 25 25 25 37 96	
MUFFS 101 101 101 201 25 25 25 25 37 96 96	
1700 EAR MUFFS 27 96 37 96	
1700 EAR MUFFS 97 96	
96 26 28	
50 50 50 50 50 50 50 50 50 50 50 50 50 5	
3	
96 66 26	
50 36 42 170	
3	
1 571 404 571 960	
H-133 GRUUND COMMUNICATION UNIT	
50 85 2	
COMMUNICATION PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN D3) PSIL 115 118 110	
AMMOYANCE PERCEIVED NOISE LEVEL (PNL IN PNDB) PNL 135 140 140 130	

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE. P ADDITIONAL EAR PROTECTION REQUIRED.

TABLE 4

TEST CONDITIONS FOR FAR-FIELD NOISE MEASUREMENTS

F-111A Aircraft, Ground Runup Wright-Patterson AFB, 29 August 1967 Tail # 63-9775

Aircraft Engine Operation

Military Power Single Engine

Military Power Both Engines

Afterburner Power Single Engine

Meteorology

 Temperature
 21 ℃

 Bar Pressure
 0.767 M Hg

 Rel Humidity
 55 %

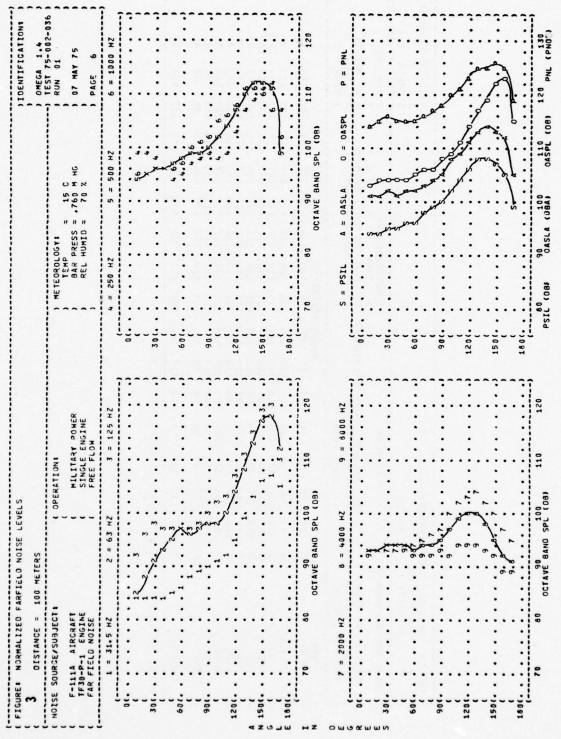
 Wind — Speed
 1.5 M/Sec (3 Kt)

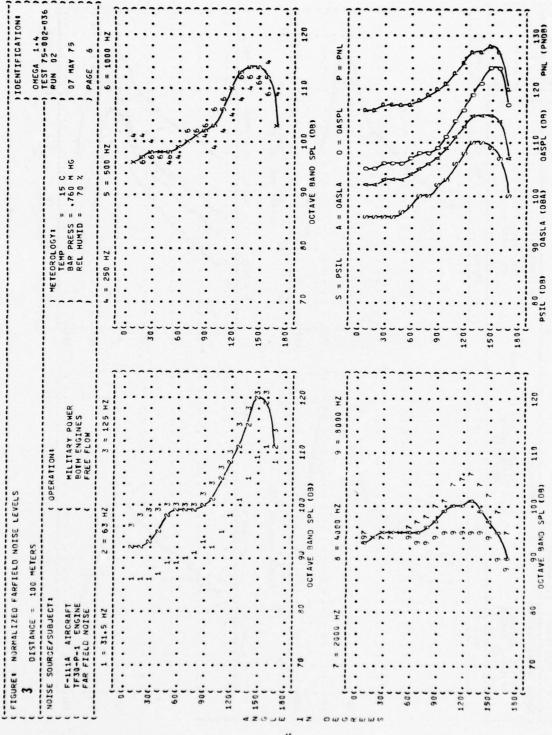
 — Direction
 260 Deg.

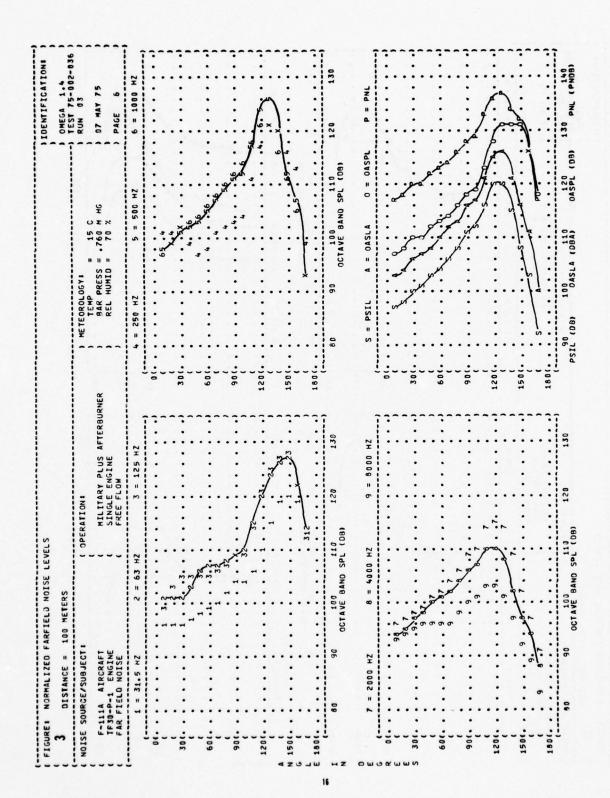
5 oct	OCTAVE BAND DISTANCE =		76 METERS	ND = 76 METERS													OMEGA	1.4	ONEGA 1.4
NOISE SOURCE/SUBJ	/ SUBJE	ECT		90	OPERATION:	» »				~ ~	ETEOR	METEOROLOGY:				7	RUN 01	11	50-7
F-111A AIRCRAFT TF30-P-1 ENGINE FAR FIELD NOISE	RCRAFT ENGINE NOISE				MILITARY POWER SINGLE ENGINE FREE FLOW	ENG .	DWER				BAR	PRESSHUMID		767 M H 55 %	9		07 HAY 75 PAGE 2	2 2	
FREQ (HZ)	0	8	20	30	0,	50	9	7 0 A	ANGLE	(DEGREES) 90 100	EES)	110	120	130	140	150	160	170	180
31.5		98	98	98	98	87	80	9.0	91	92	93	76	16	101	105	108	109	101	
63		87	9.0	93	95	16	66	86	66	100	100	102	106	110	115	119	120	114	
125		46	96	100	66	66	66	66	100	102	104	105	109	113	1117	121	122	112	
250		101	101	100	86	96	26	66	100	101	100	101	105	109	111	113	114	109	
200		96	26	98	96	66	100	101	101	102	104	106	109	112	114	114	113	101	
1000		26	97	96	86	98	66	102	103	104	107	108	110	113	113	112	109	104	
2000		96	96	96	96	16	16	86	66	100	103	105	106	101	105	103	100	96	
4 3 0 0		96	96	97	16	46	96	16	26	98	100	102	103	103	101	86	95	16	
8000		66	96	16	46	96	95	96	96	96	95	46	46	46	96	95	95	36	
UVERALL		106	106	107	106	101	107	108	109	110	112	113	116	119	122	124	125	118	

NOISE SOURCE/SUB.	DISTANCE =		76 NETERS	ERS C OP	OPERATIONS	ONE				~	HETEOROLOGY	01067				77	OMEGA 1.4 TEST 75-002-036 RUN 02	1.4 75-00	2-03
F-111A AIRCRAFT TF30-P-1 ENGINE FAR FIELD NOISE	CCRAFT ING INE				MILIT BOTH FREE	ARY PENGIN	MILITARY POWER BOTH ENGINES FREE FLOW				TEMP BAR REL	PRESS		21 C 767 H 55 %	9		OF HAY	2 2	
FREQ (HZ)	0	07	20	30	9	50	9	2	ANGLE	(DEGREES) 90 100	EES)	110	120	130	140	150	160	170	180
31.5		88	88	88	89	91	91	92	93	96	*6	16	100	103	107	111	113	110	
63		16	96	95	26	100	101	101	101	102	103	101	110	113	117	122	121	113	
125		96	100	101	101	102	102	102	102	104	106	109	112	117	120	123	123	116	
250		103	103	102	100	96	66	102	103	103	101	104	107	110	112	114	117	111	
200		96	66	100	100	100	101	102	103	104	105	100	112	115	116	116	114	105	
1000		98	96	66	66	66	101	104	104	105	108	110	112	114	114	113	111	105	
2000		86	26	97	16	86	66	100	101	103	104	107	108	109	107	105	102	96	
0000		96	26	86	86	96	9 6	96	66	100	102	103	103	104	102	100	86	93	
8000		16	46	96	98	98	16	96	96	26	98	96	98	98	98	26	93	91	
OVERALL		108	108	108	108	108	109	110	111	112	113	116	119	122	124	127	126	120	

5 OCTAVE B	d	7	D PRESSUR 76 METERS	ERS	SUUND PRESSURE LEVEL NO = 76 METERS	(90)											OMEGA 1.4	1.4	LOND
NOISE SOURCE/SUBJECT	JECI	-		90	OPERATION	. NO				~	ETEOR	0100				-	RUN	03	50-7
F-111A AIRCRAFT TF30-P-1 ENGINE FAR FIELD NOISE	F N S				MILITARY PLUS SINGLE ENGINE FREE FLOM	ARY P E ENG FLOW	LUS A	VFTER8	AFTERBURNER		TEMP BAR REL	TEMP BAR PRESS REL HUMIO		21 C 767 M 55 %	9		O7 HA	MAY 75 E 2	
FREQ (HZ)		97	20	30	3	50	9	4 0 L	ANGLE 80	(DEGREES) 90 100	EES)	110	120	130	140	150	160	170	180
31.5		86	96	98	66	100	101	102	104	106	106	108	112	117	121	122	121	115	
63	-	103	103	103	105	108	109	109	110	111	112	117	122	126	128	129	124	116	
125	7	101	105	107	101	101	101	108	109	111	111	116	123	127	129	130	124	114	
250	-	103	103	104	101	66	100	103	104	105	106	113	119	123	122	118	115	101	
500	7	00	101	103	101	105	107	109	111	113	114	119	126	128	122	114	109	95	
1000		66	101	104	105	106	108	110	112	114	116	120	123	123	118	113	107	96	
2000		66	100	101	102	104	105	107	109	112	113	117	118	117	112	105	100	16	
0004		16	96	100	101	103	104	105	107	109	110	113	113	111	105	100	46	91	
8000		96	16	98	66	66	66	66	101	103	104	106	106	104	100	95	95	98	
OVERALL	-	110	111	112	113	114	115	1117	118	120	121	126	131	133	133	133	128	120	







•			DOMEGA 1.4
NOISE SOURCE/SUBJECT:	(OPERATION:	•	RUN 01
F-111A AIRCRAFT	C MILITARY POWER	BAR PRESS = .767 M HG) 07 MAY 75
TF30-P-1 ENGINE FAR FIELD NOISE	(SINGLE ENGINE (FREE FLOW	×) PAGE 3
	1 = 0CTAVE	0 = OVERALL	PWL
31.5	1	· · · · · · · · · · · · · · · · · · ·	145.3
63 (155.5
125 (157.5
250			151.4
			153.3
1000 (· · · · · · · · · · · · · · · · · · ·	153.5
2000		· · · · · · · · · · · · · · · · · · ·	148.6
		· · · · · · · · · · · · · · · · · · ·	146.8
8000			144.7
OVERALL (162.2

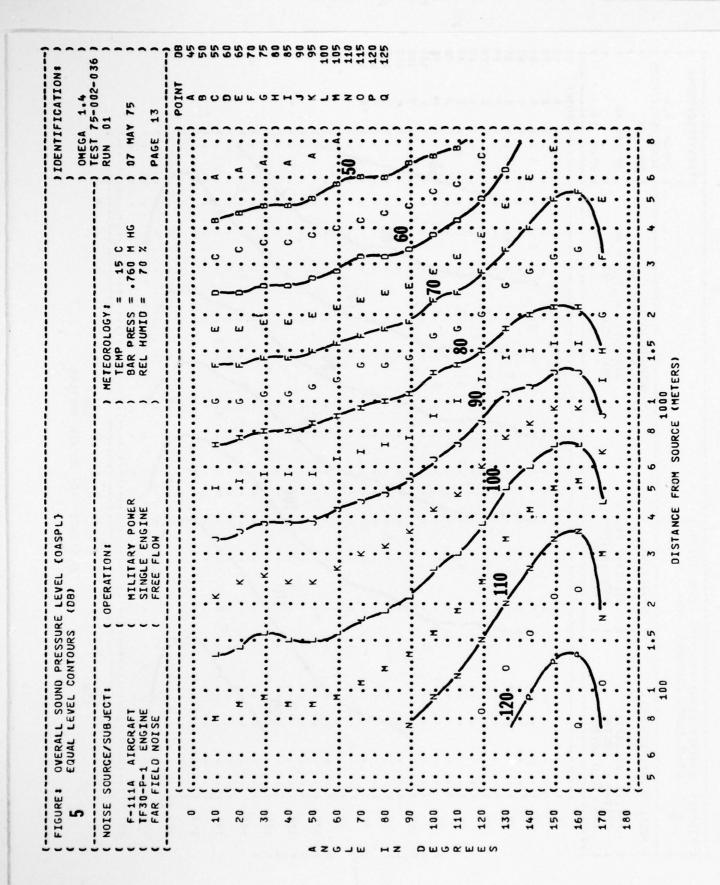
F-111A AIRCRAFT (OPERATION:) HETEOROLOGY: F-111A AIRCRAFT (MILITARY POWER) BAR PRESS = TF30-P-1 ENGINE) REL HUNIO = FAR FIELD NOISE (FREE FLOW) REL HUNIO = 1 = 0CTAVE) COVERALL 31.5 (= 21 C
HILITARY POWER BAR PRESS BOTH ENGINES REL HUMIO FREE FLOW 1 = OCTAVE 0 = OVERALL	25 X HG
FREE FLOW 1 = OCTAVE 0 = OVERALL	PAGE
1 = OCTAVE 0 = OVE	
	157.7
	•
	159.6
	7.004
	155.5
	154.8
···	••
	150.5
	148.0
	146.1
	164.3
110 120 130 140 150 160	170

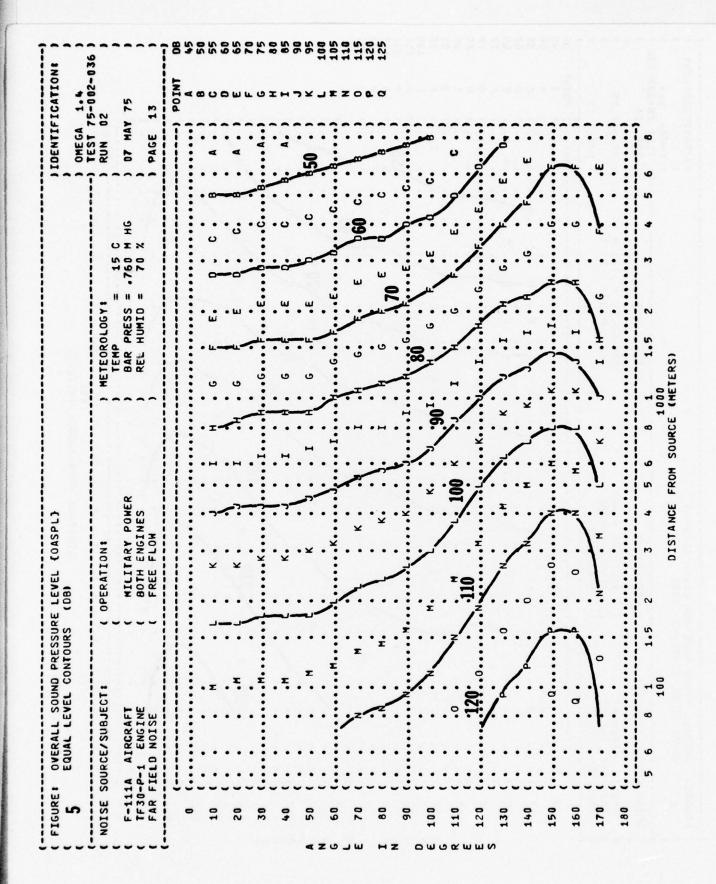
FIGURE: ACOUSTIC	STIC POWER LEVEL (PWL)	(PML)				OMEGA 1.4
NOISE SOURCE/SUBJECT	SUBJECT	OPERATIONS	-) MET	L06 7 8	, RUN 03
F-111A AIRCRAFT TF30-P-1 ENGINE	AIRCRAFT ENGINE	MILITARY PLUS	Y PLUS AFTERBURNER ENGINE			1 07 MAY 75
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OVERALL			.:.		••••••	172.7
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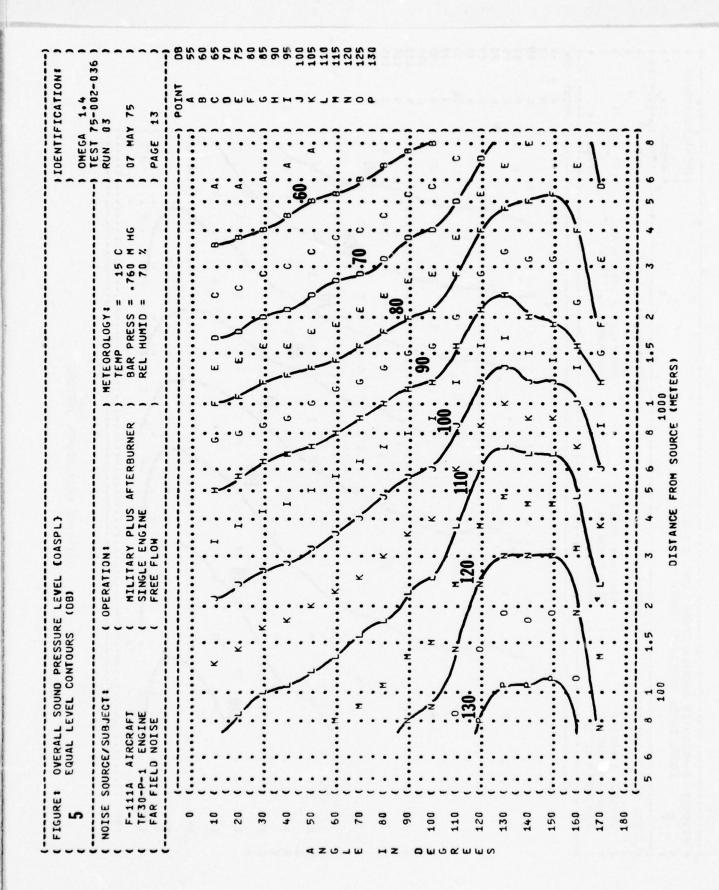
TABLE: DIREC	TIVIT	NI Y	DIRECTIVITY INDEX (08)	08)													IDENTIFICATIONS OMEGA 1.4	ICAT!	NOI
NOISE SOURCE/SUBJE	UBJEC	ECT		do)	OPERATION	. N.				7	ETEOR	METEOROLOGY :	! .			7-	TEST 75-002-036 RUN 01	5-00	2-03
F-111A AIRCRAFT TF30-P-1 ENGINE FAR FIELD NOISE	RAFT				MILITARY POWER SINGLE ENGINE FREE FLOW	ENG FLOW	OWER				BAR P REL H	PRESS = HUMID =		.767 H + 55 %	9		O7 HAY PAGE	HAY 75	
FREQ (HZ)		2	20	30	0,	20	6.9	4 0 Z	ANGLE	(DEGREES) 90 100	EES)	110	120	130	140	150	160	170	180
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1000		-11	-11	-10	-10	-10	6-	9-	-5	4-	7	0	2	2	2	3	-	1	
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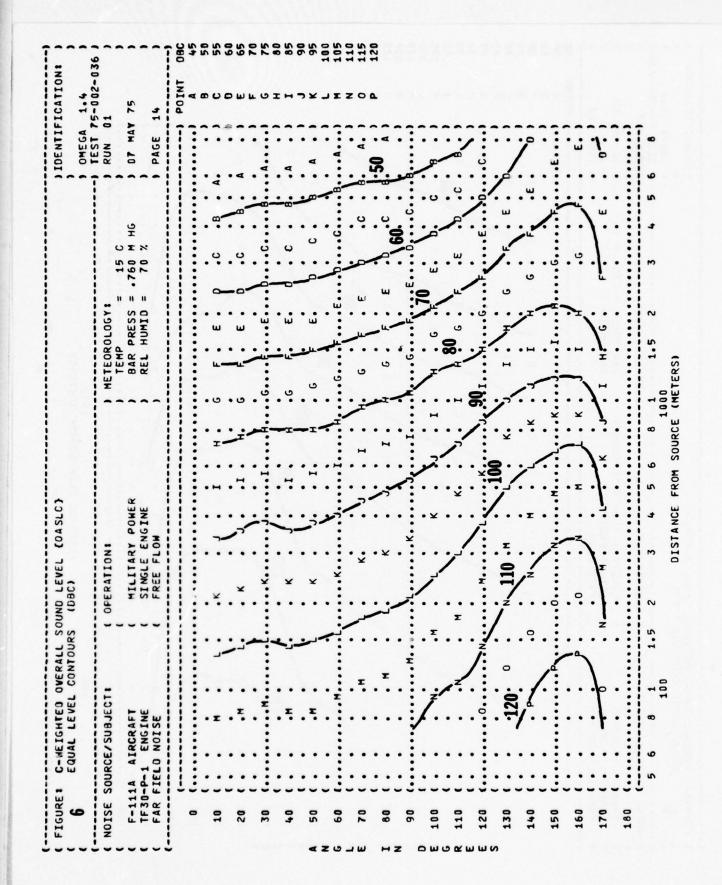
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FAR FIELD NOISE	ш		_	FREE	FREE FLOW				-						-	PAGE	4	
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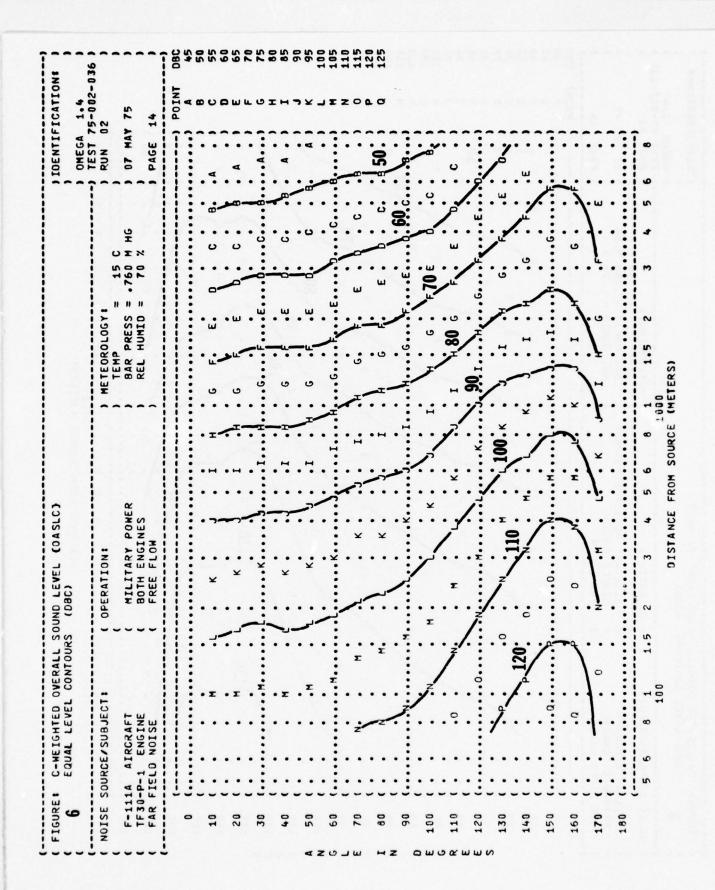
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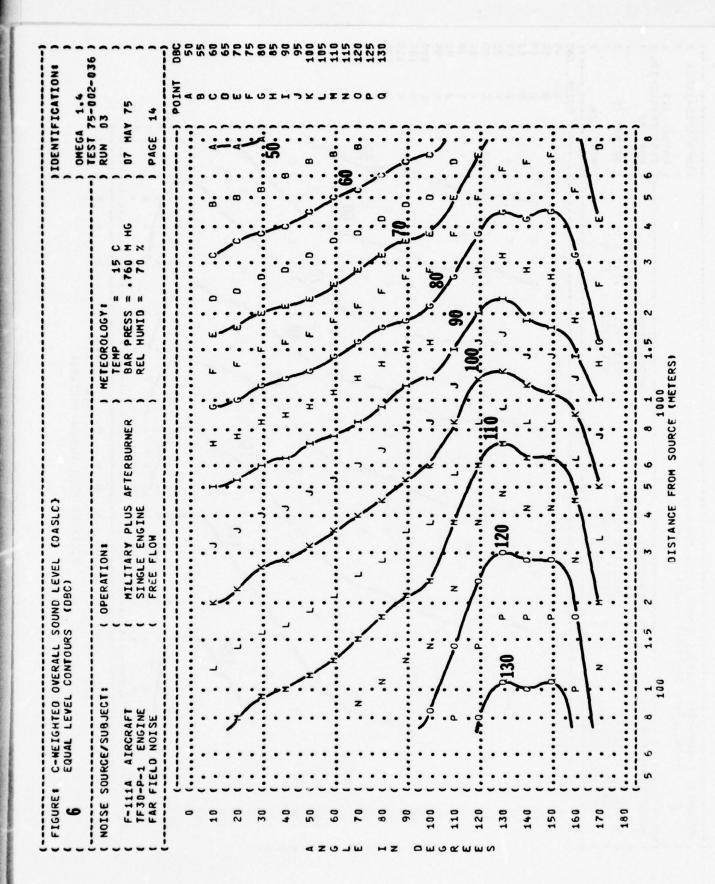


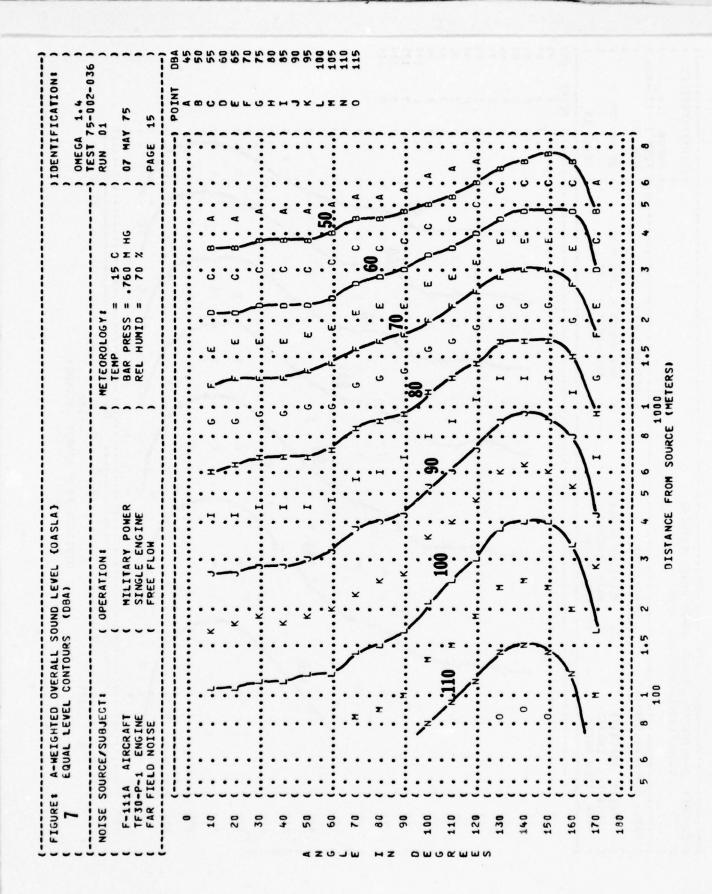


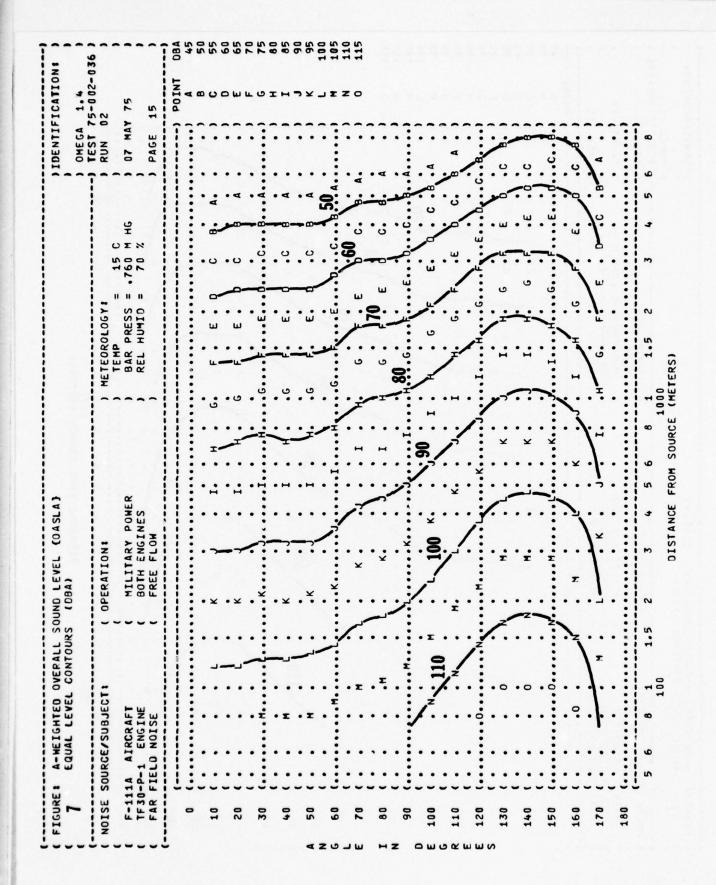


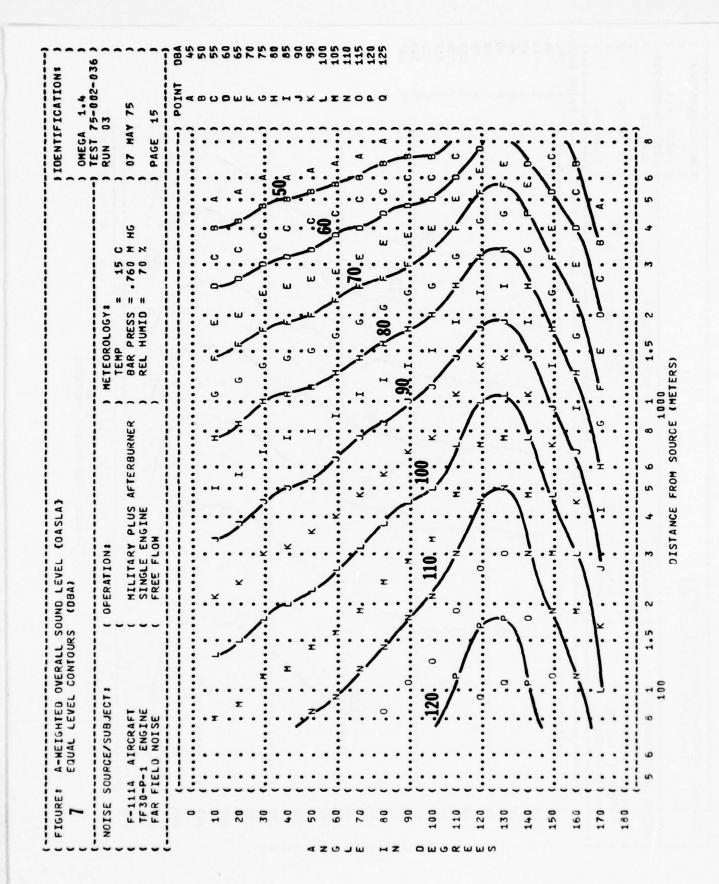


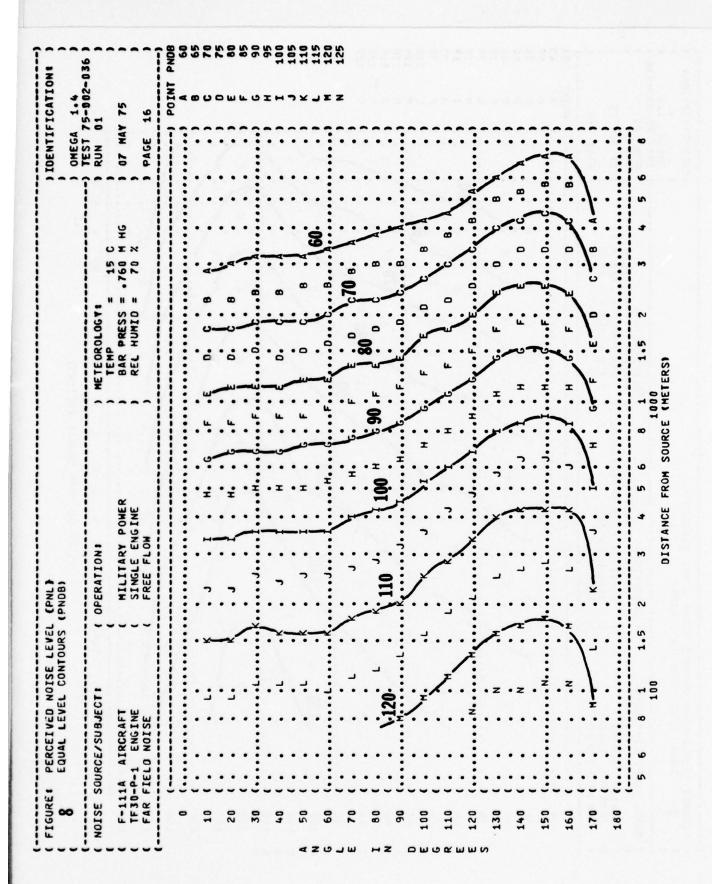


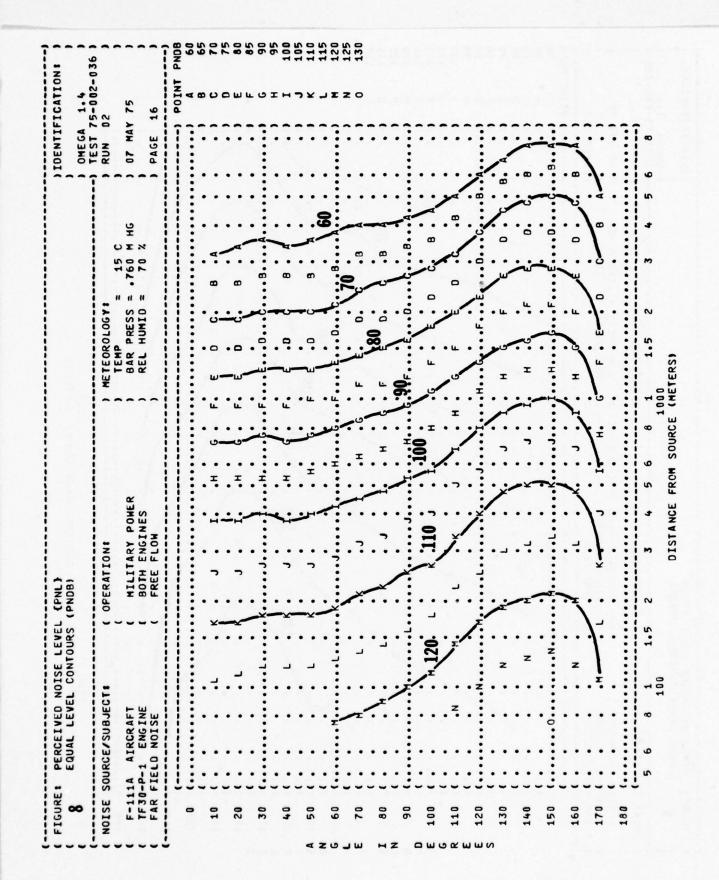


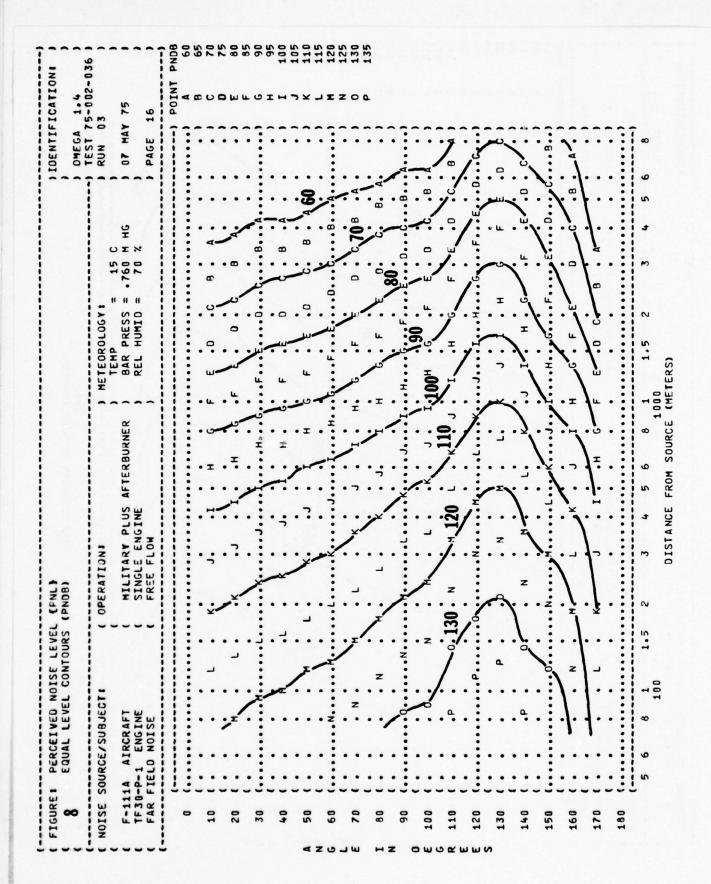


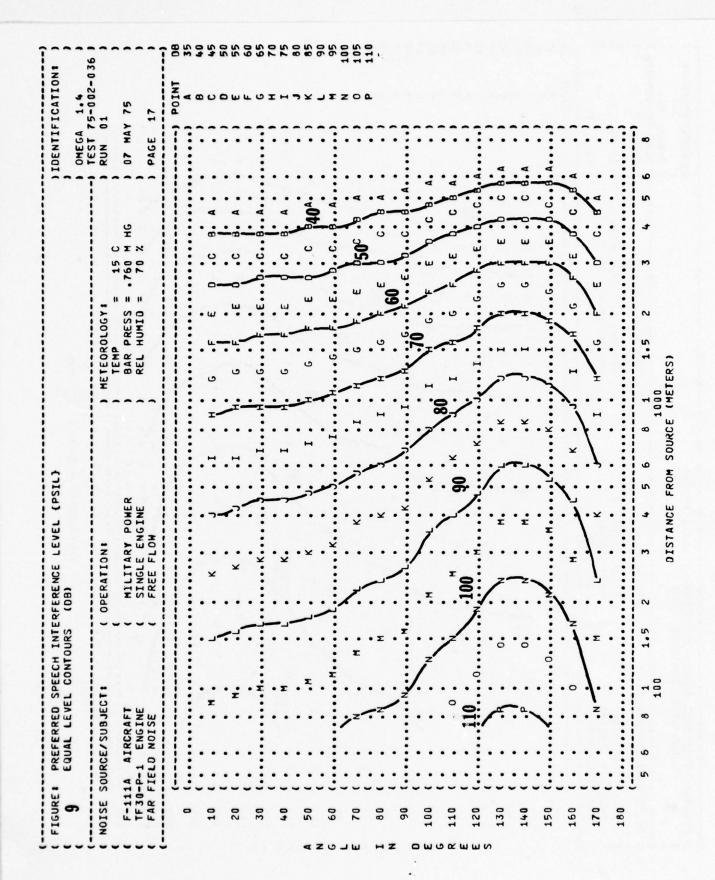


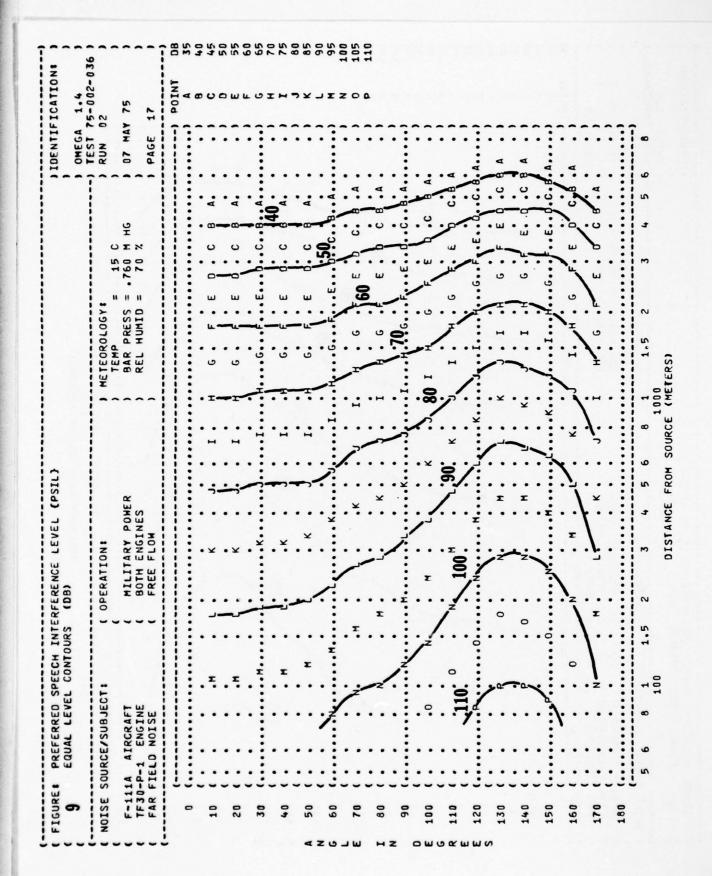


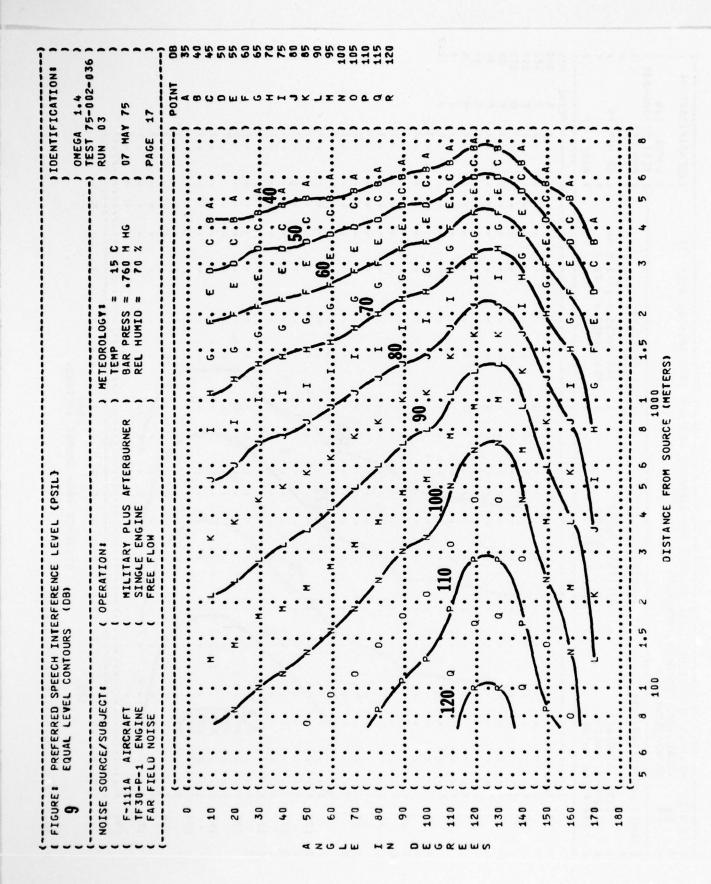












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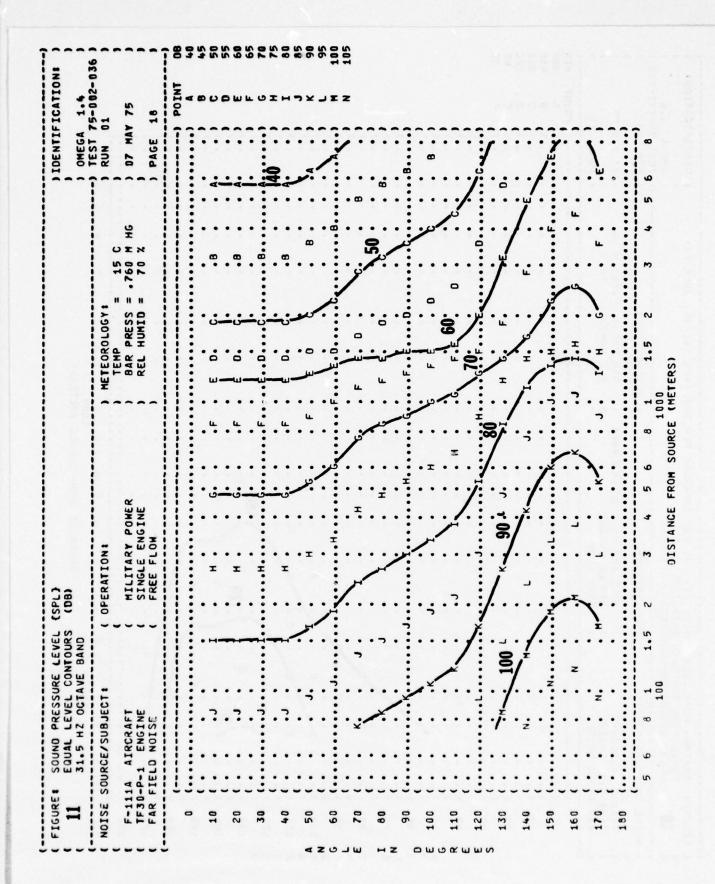
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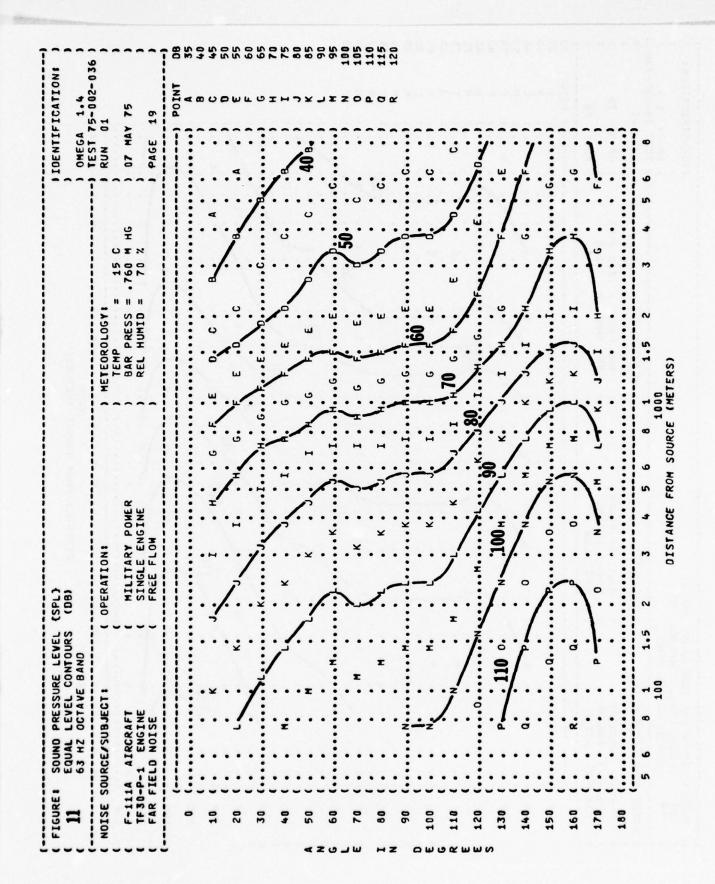
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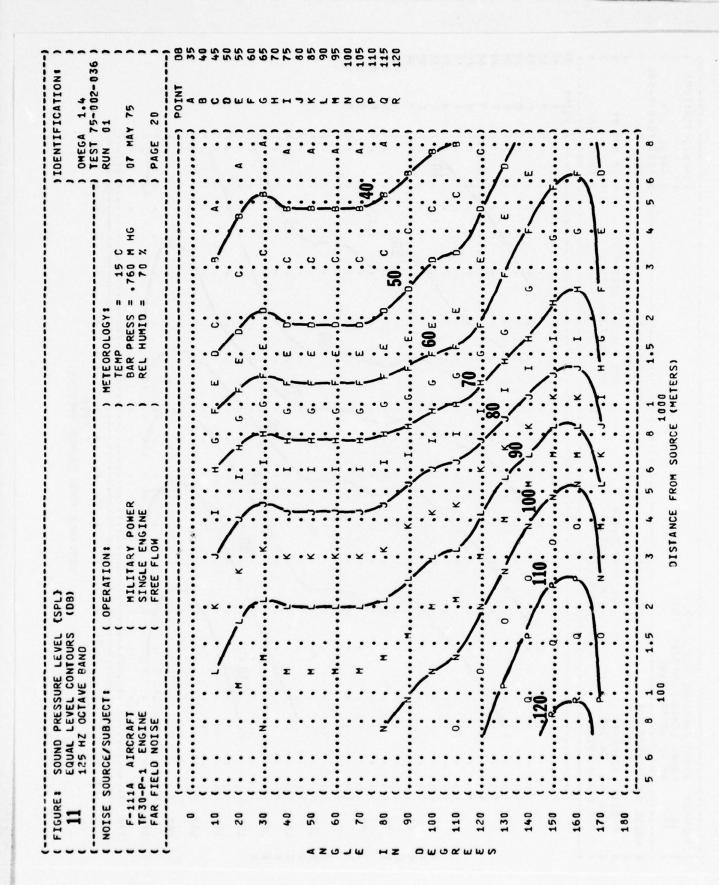
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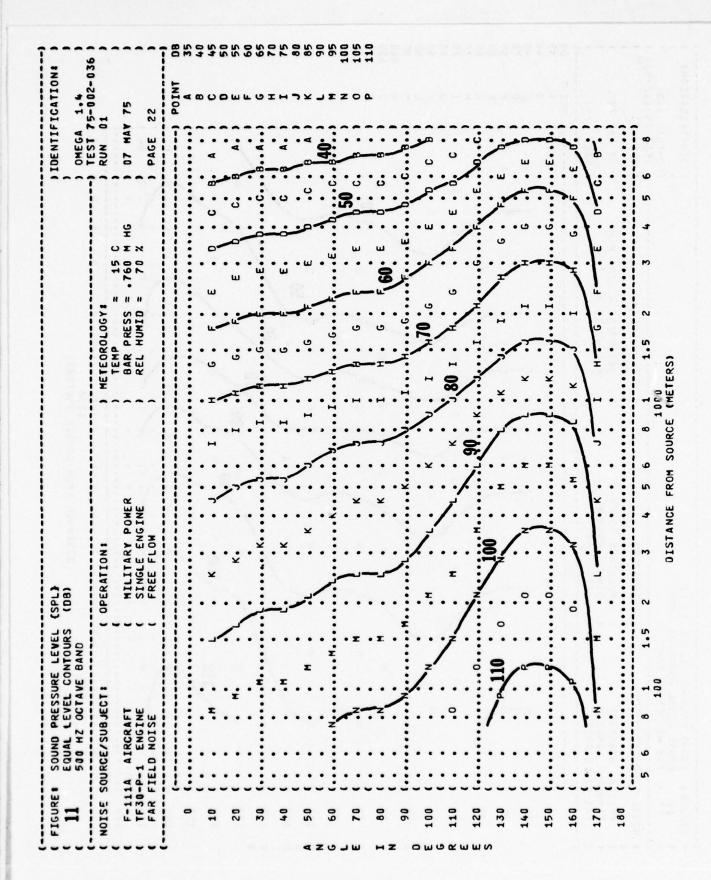
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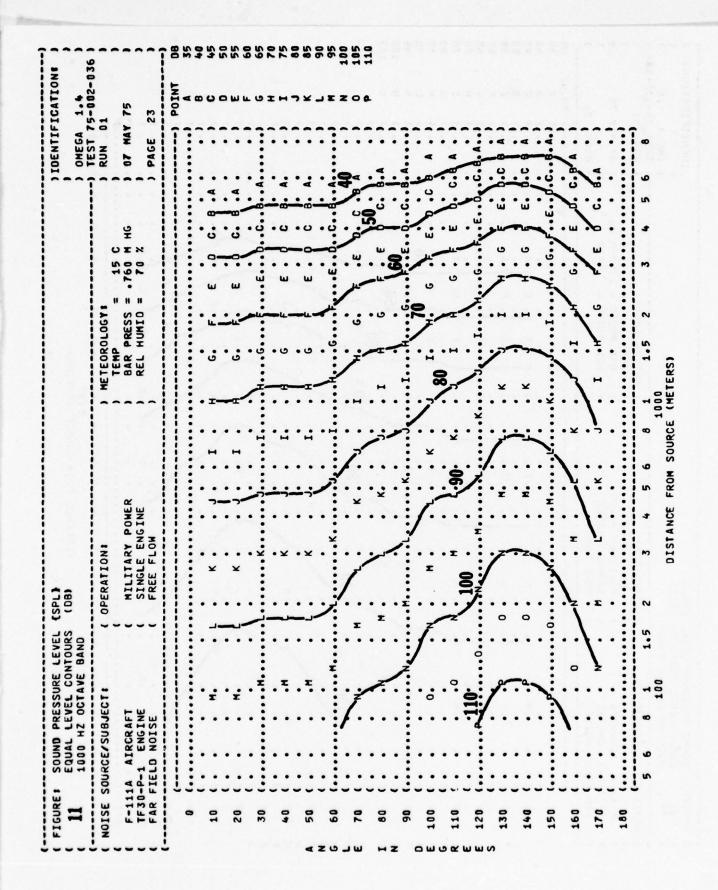


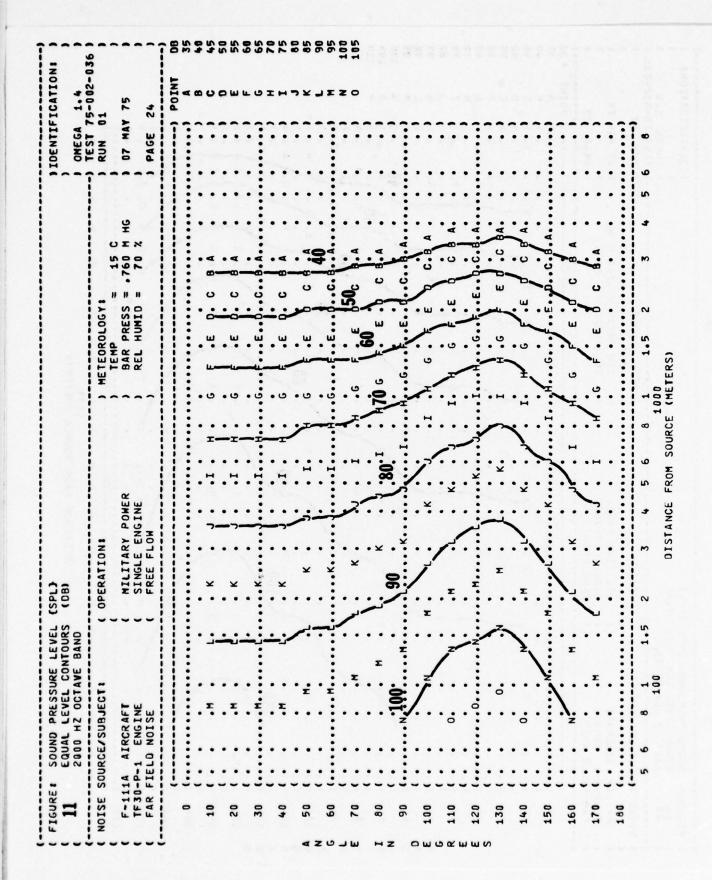




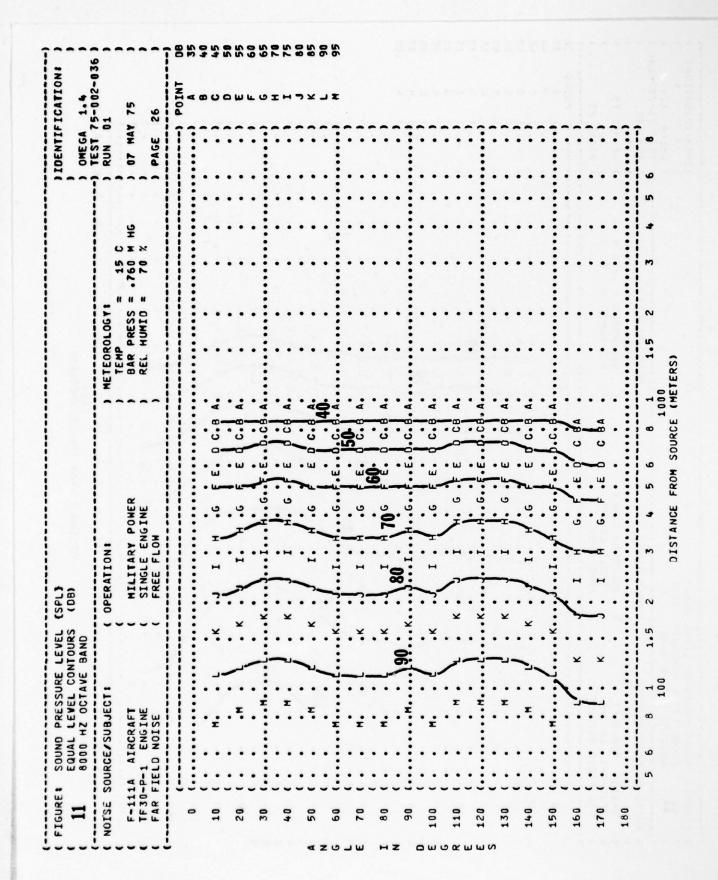
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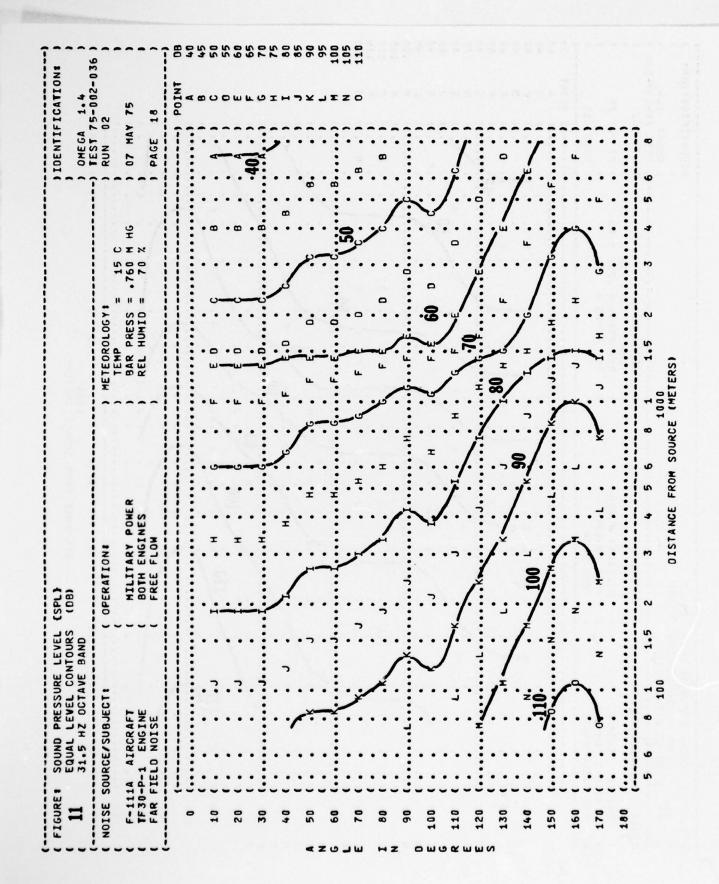


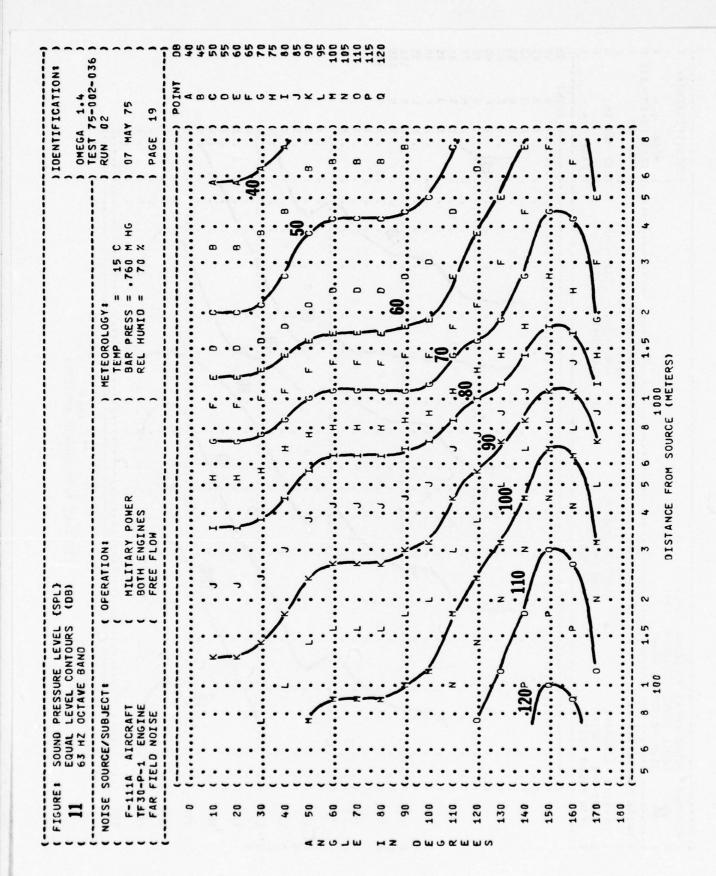


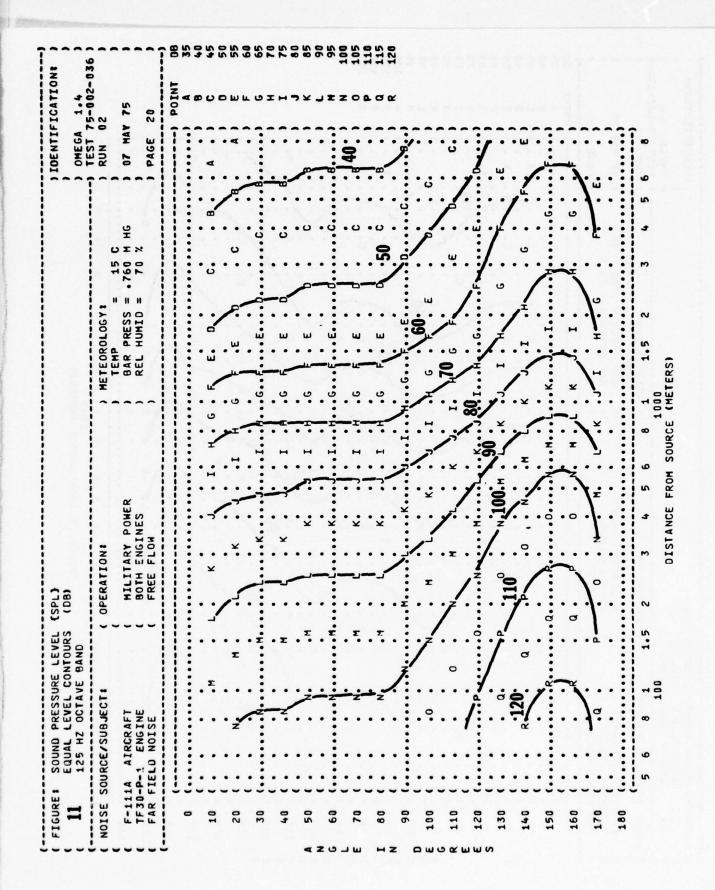


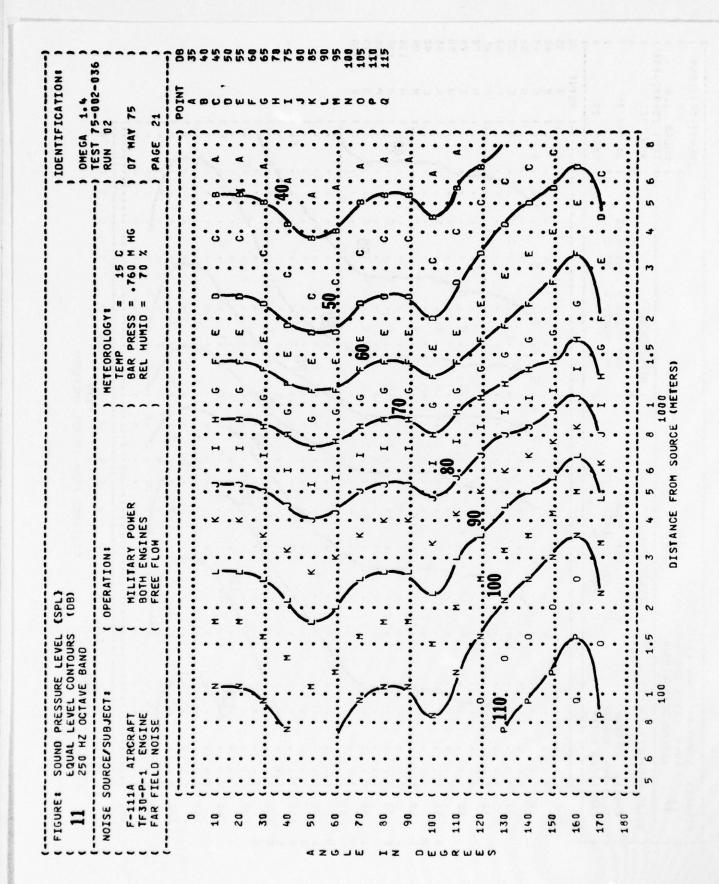
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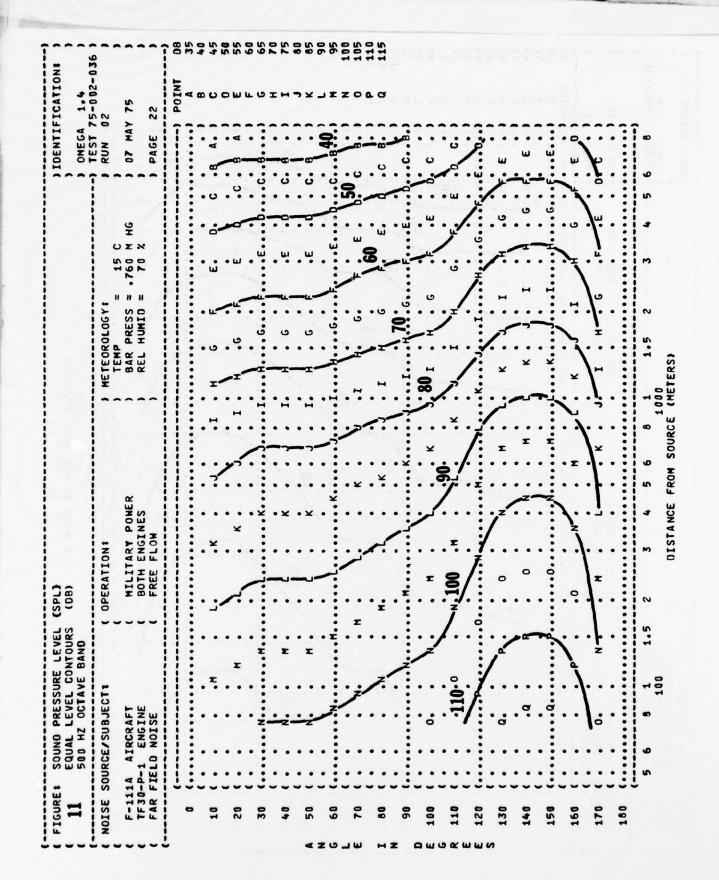


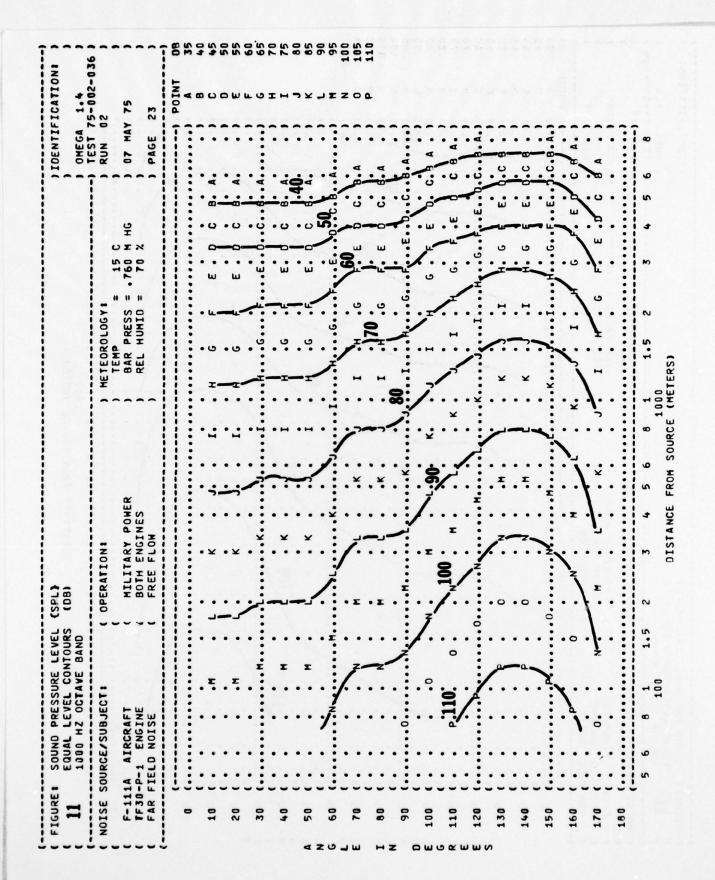


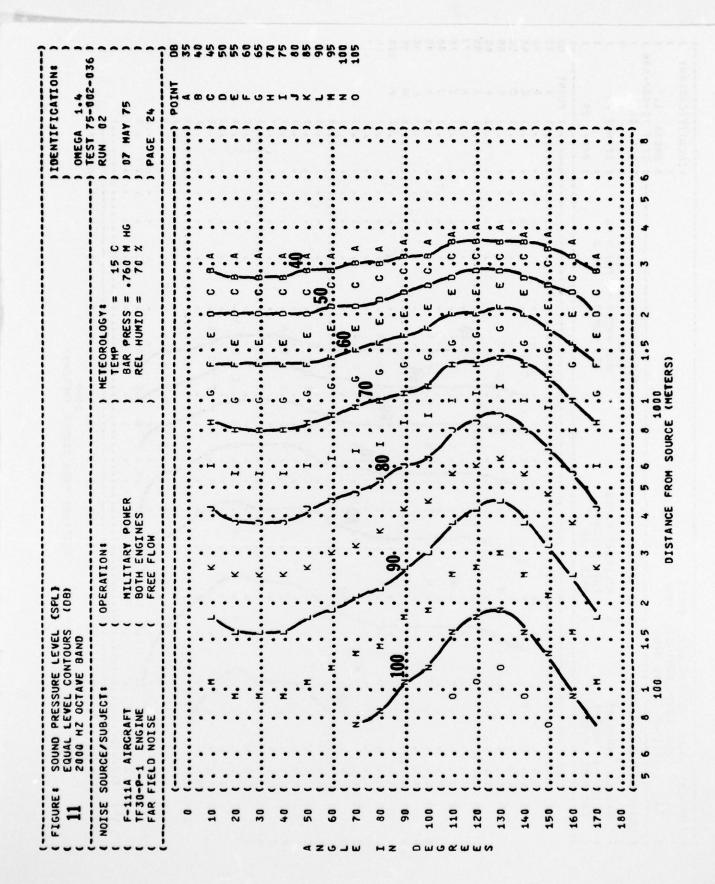


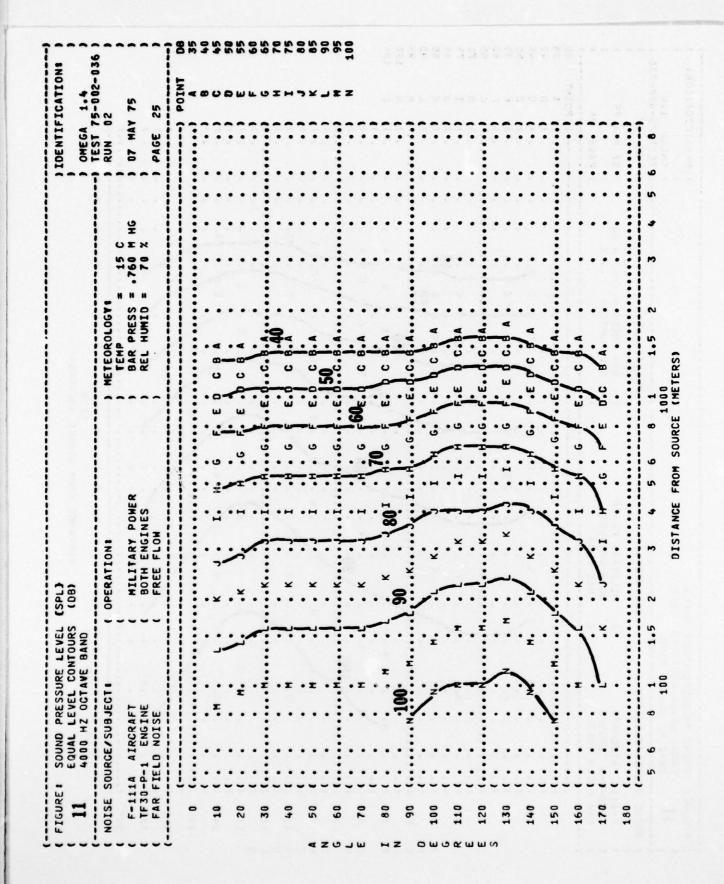












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11 EQUAL LEVEL CONTOURS 8000 HZ OCTAVE BAND	SUBJ CRAF INGIN		· · · · · · · · · · · · · · · · · · ·	····	 				7

